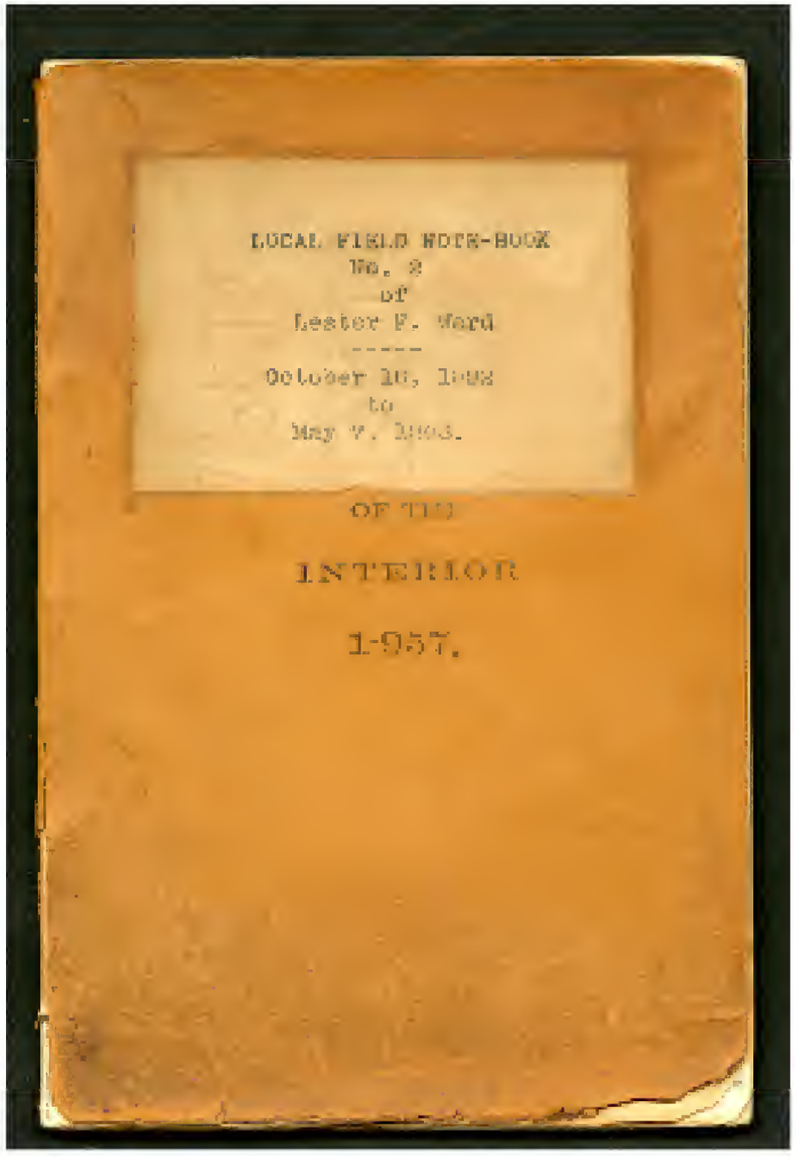
# Local field note-book of Lester Ward

Extracted on Oct-11-2015 07:35:03

LOCAL FIELD NOTE-BOOK
NO. 2
of
Lester F. Ward
October 16, 1892
to
May 7, 1893.

OF THE
INTERIOR

1-957

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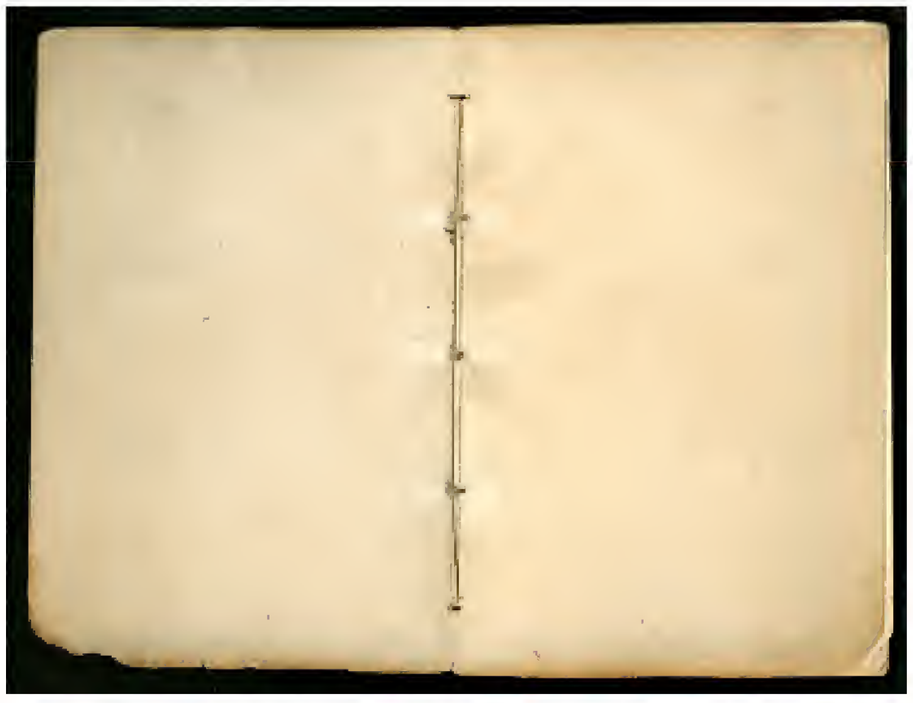

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Local Field Note book of  Lester F. Ward
[[line]]
No. 2
[[line]]
1892
[[line]]
Oct.16- Took the new electric cars to Mt. Vernon. Being Sunday they stopped at Little Hunting Creek. Potomac clays and sands were visible in several of the cuts on the way down. There is a deep cut half a mile north of the gate into the grounds, and here there is no Potomac, but there are 5 or 6 feet of marine deposits, Chesapeake clays above and apparently Pamunkey Greensand below.
I tried to go around the grounds
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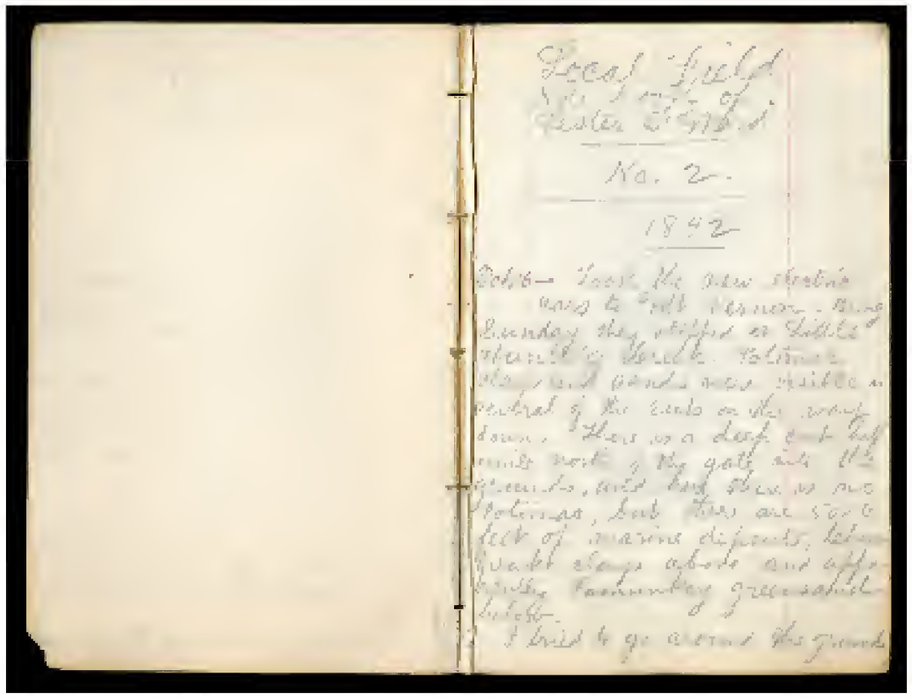


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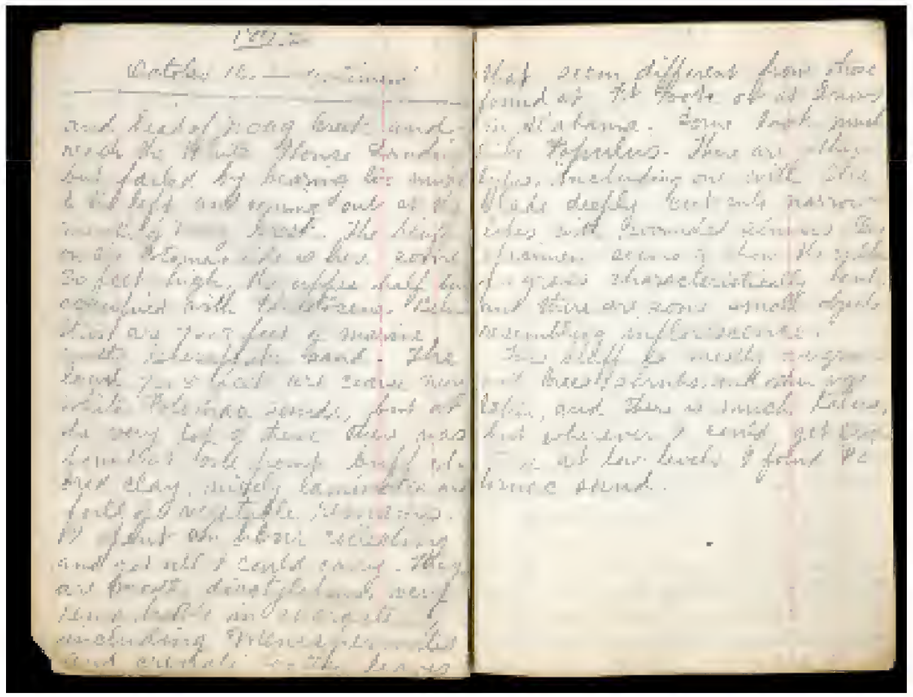
[[underline]] 1892 [[/underline]]
October 16, -continued
[[line across page]]
and head of Doag Creek and reach the White House Landing but failed by bearing too much to the left and coming out at the mouth of Doag Creek. The bluff on the Potomac side is here some 30 feet high,the upper half being occupied with Pleistocene. Below this are 7 or 8 feet of marine, mostly Chesapeake sand. The lower 7 or 8 feet are coarse nearly white Potomac sands, but at the very top of these there was found at one point buff colored clay, nicely laminated and full of vegetable remains. I spent an hour collecting and got all I could carry. They are mostly dicotyledons, very remarkable in character including Menispermitis and crenate toothed leaves
[[end page]]

[[start page]]
that seem different from those found at Ft. Foote or at Snows in Alabama. Some look much like Populus. There are other types, including one with the blade deeply cut into narrow lobes with rounded sinuses. One specimen seems to show the [[culm?]] of a grass characteristically bent, and there are some small objects resembling inflorescence.
[[indent]]This bluff is mostly overgrown with trees, shrubs, and other vegetation, and there is much talus, but wherever I could get through these at low levels & found Potomac sand.
[[end page]]



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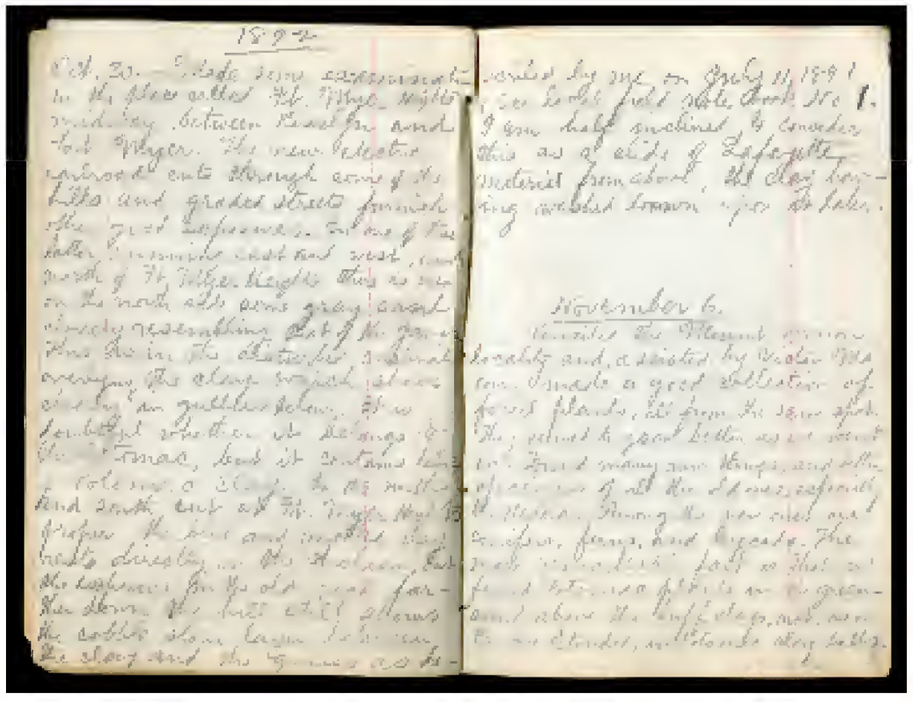
[[underline]] 1892 [[/underline]]
Oct. 30.-Made some examinations in the place called Ft. Myer Heights midway between Rosslyn and Fort Myer. The new electric railroad cuts through some of the hills and graded streets furnish other good exposures. In one of these latter running east and west, and north of Ft. Myer Heights there is seen on the north side some gray sand closely resembling that of the James. This is in the disturbed material overlying the clay which shows clearly in gullies below. It is doubtful whether it belongs to the Potomac, but it contains balls of Potomac clay. In the north and south cut at Ft. Myer Heights proper the blue and mottled clay rests directly on the Archean, but the exposure in the old road farther down the hill still shows the cobble stone layer between the clay and the gneiss as de-
[[end page]]
[[start page]]
scribed by me on July 11, 1891 (See local field note book No 1, I am half inclined to consider this as a slide of Lafayette material from above, the clay having washed down upon it later.
[[underline]] November 6. [[/underline]]
Revisited the Mount Vernon locality and, assisted by Victor Mason, made a good collection of fossil plants, all from the same spot. They seemed to grow better as we went in. Found many new things, and better specimens of all the old ones, especially the Hedera. Among the new ones are conifers, ferns, and cycads. The most remarkable fact is that we found Potomac plants in the green-sand above the buff clays, not, as on Pa Ave Extended, in Potomac clay balls.



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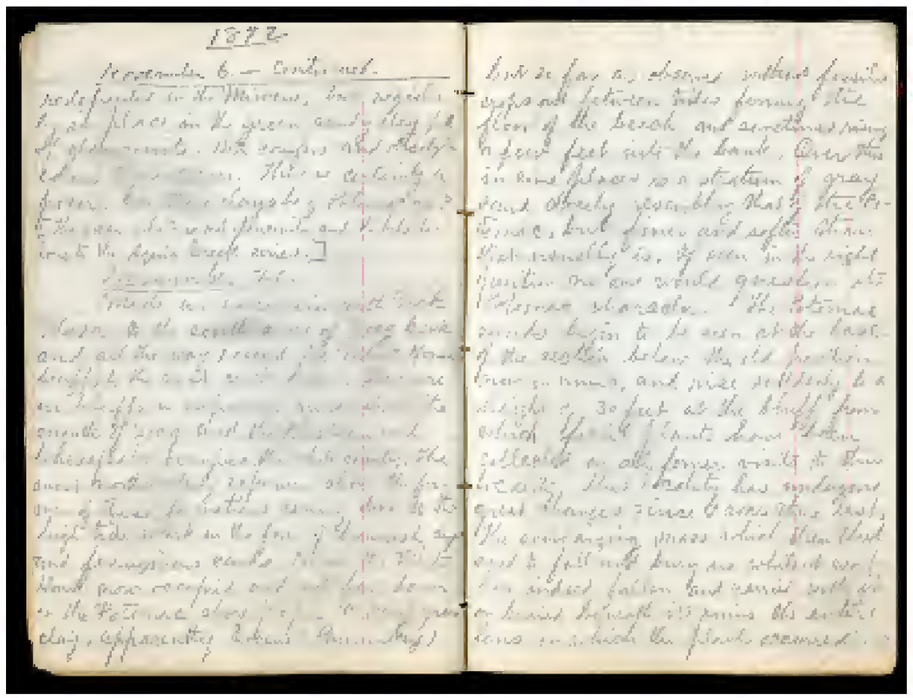
[[underline]] 1892 [[/underline]]
November 6-continued.
[[line across page]]
redeposited in the Miocene, but regularly in place in the green sandy clay full of glauconite. Both conifers and dicotyledons stems occur. This is certainly a poser. Can these clays be of Potomac age? [The green color is not glauconite and the bits belong to the Aqua Creek series.]
[[underline]] November 20. [[/underline]]
Made an excursion with Vick Mason to the south shore of Doag Creek and all the way round the White House bluffs to the next creek below. There are no bluffs or exposures much above the mouth of Doag and the Pleistocene and Chesapeake occupies the whole country. The most northwesterly exposures show the former of these formations coming down to the high tide mark in the form of brownish clays and ferruginous sands. Near the White House now occupied and not far down on the Potomac shore proper a very green clay, apparently Eocene (Pamunkey)
[[end page]]

[[start page]]
but as far as observed without fossils crops out between tides forming the floor of the beach and sometimes rising a few feet into the bank. Over this in some places is a stratum of gray sand closely resembling that of the Potomac, but finer and softer than that usually is. If seen in the right position no one would question its Potomac character. The Potomac sands begin to be seen at the base of the section below the old pavilion, now in ruins, and rise suddenly to a height of 30 feet at the bluff from which fossil plants have been collected on all former visits to this locality. This locality has undergone great changes since I was there last. The overhanging mass which then threatened to fall and bury us while at work has indeed fallen and carried with it or buried beneath its ruins the entire lens in which the plants occurred.



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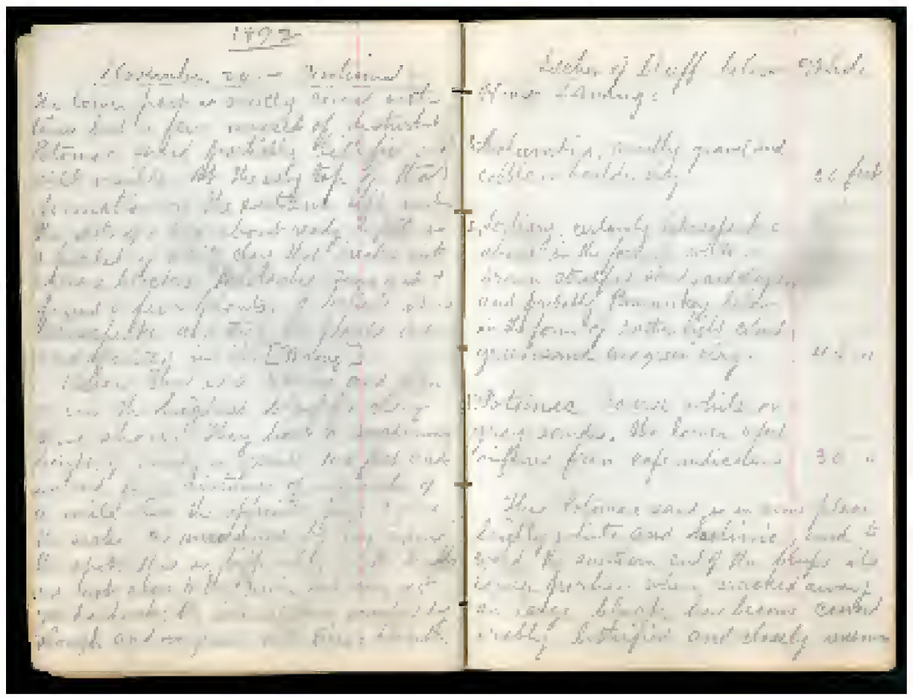
[[underline]] 1892 [[/underline]]
[[underline]] November 20 - continued. [[/underline]]
the lower part is mostly covered with [[latus?]] but a few masses of disturbed Potomac sand partially lithified are still visible. At the very top of that formation on the extreme left under the roots of a tree about ready to fall is a pocket of white clay that breaks into square blocks. [[I?]] detached some of it & found a few plants. I believe it is Chesapeake and that the plants are redeposited in it. [Wrong]
Below this is a ravine and then occur the highest bluffs along this shore. They have a maximum height of nearly or quite 100 feet and extend for a distance of a quarter of a mile. On the opposite page I give the section as measured by my eyes on the spot. This is difficult, as the bluffs are not close to the river but come 45 yards back, the interval being occupied by slough and overgrown with trees & shrubs.
[[end page]]
[[start page]]
Section of bluff below White
House Landing:

3. Columbia, mostly gravel and
cobble or boulder clay 30 feet

2. Tertiary, certainly Chesapeake
above in the form of white or
brown stratified sands and clays,
and probably [[Pammikey?]] below
in the form of rather light colored
green sand and green clay. 40 "

1. Potomac coarse white or
gray sands. The lower 6 feet
inferred from safe indications 30 "

This Potomac sand is in some place brightly white and kaolinic, and toward the southern end of the bluffs its lower portion where cracked away in large block has become considerably lithified and closely resembles



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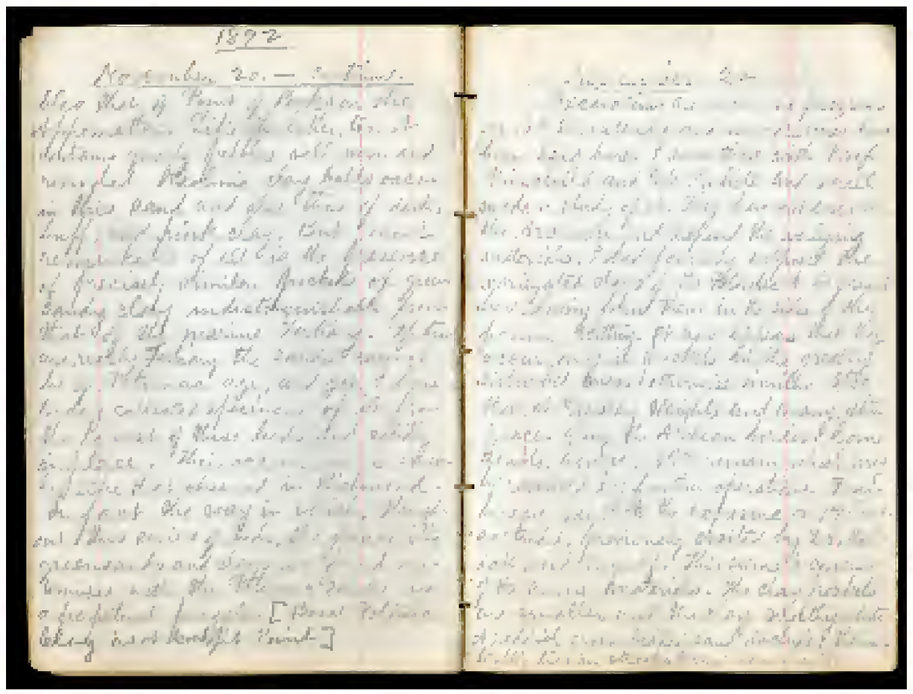
[[underline]] 1892 [[/underline]]
[[underline]] November 20. - continued. [[/underline]]
bles that of Point of Rocks on the Appomattox. Like the latter, too, it contains quartz pebbles well worn and rounded. Kaolinic clay balls occur in this sand and also those of dark, buff, and pink clay. But most remarkable of all is the presence of precisely similar pockets of green sandy clay indistinguishable from that of the marine Tertiary. If these are really Tertiary the sands cannot be of Potomac age, and yet I have to-day collected specimens of it from the lowest of these beds and solidly in place. Their occurrence is exactly like that observed in Richmond. In fact the way in which, throughout this series of beds, the glanconitie greensands and clays are found intermixed with the Potomac sands is a perpetual puzzle. [Basal Potomac Clay as at [[Locksmith?]] Point]

[[end page]]
[[start page]]

[[underline]] November 24. [[/underline]]
Excavations are now in progress on 16th St. extended and new features have been laid bare. I went there with Prof. Fairchild and Mr. White and we all made a study of it. They have cut down to the Archean and exposed the overlying materials. I had formerly supposed the variegated clays of the Potomac to be present here, having found them in the sides of the former cutting. It now appears that they occur only in pockets in the greatly disturbed mass otherwise similar the other at Weslay Heights and many of the places along the Archean border. Some doubts, however still remain which may be removed by further operations. From here we went to the exposure on 17th St. extended, previously visited by Dr. Hollick and myself. This seems to consist of the same materials. The clay pockets are smaller and the clay mostly white A reddish cross-bedded sand include them. [[Cobble?]] lies in streaks through some [[fiarts?]]



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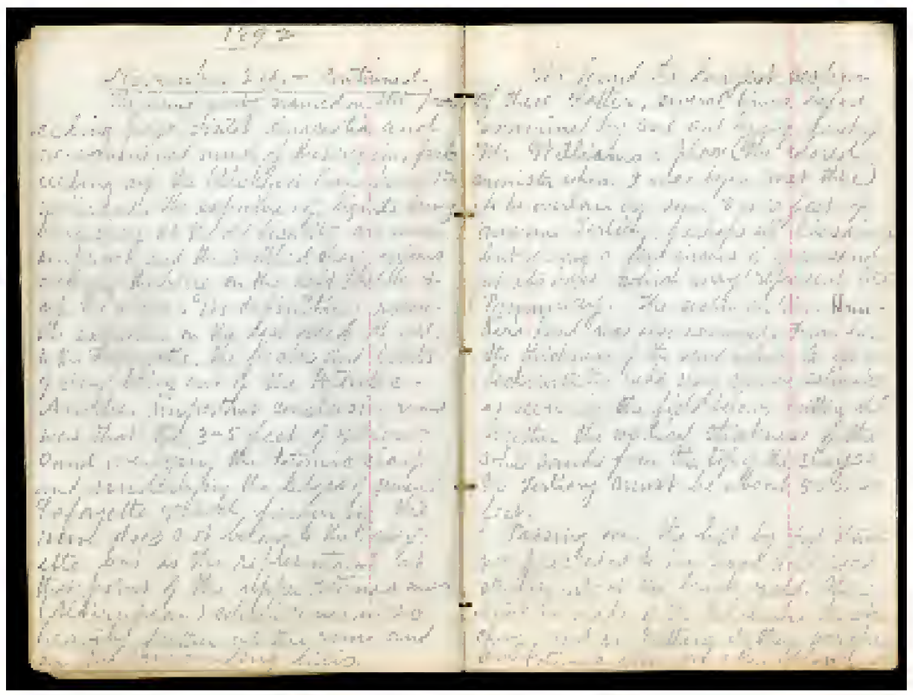
[[underline]] 1892 [[/underline]]
[[underline]] November 24. - continued [[/underline]]
The same party named on the preceding page visited Anacostia and re-examined much of that region, proceeding up the Stickfoot Run from the railroad. The exposures of lignite bearing blue clay at the old locality are much improved and the mottled clay appears overlying the blue on the left bank and up the slope. We definitively referred the exposure on the east side of the road to the Lafayette, the flecks and pellets of clay being out of the Potomac. Another important conclusion reached was that the 3-5 feet of yellow sand overlying the Potomac clay and underlying the ledges of cemented Lafayette gravel farther up the run does not belong to the Lafayette but is the representative at that point of the upper Potomac sands (Albirupean) which comes in so heavily farther up the run and on the surrounding hills.
[[end page]]
[[start page]]
We found the largest section of these latter, several times before examined by one and lying east of Mr. Williams's place (the colored minister whom I once before met there) to be overlain by some 8 or 10 feet of marine Tertiary, perhaps all Chesapeake but having a few inches of greensand at its base which may represent the Pamunkey. The section on Mr. Hunter's land was also examined. From here the thickness of the sand below to its contact with the red clay can be estimated as seen in the field below. Putting all together the vertical thickness of the white sands from the top of the clays to the Tertiary must be about 50 or 60 feet.
Passing over the hill by Fort Stanton we proceeded to the Good Hope road striking it at the brick yard. Here brick is made of the Columbia brick clay and in getting it they scrape the Potomac vein on clay floor



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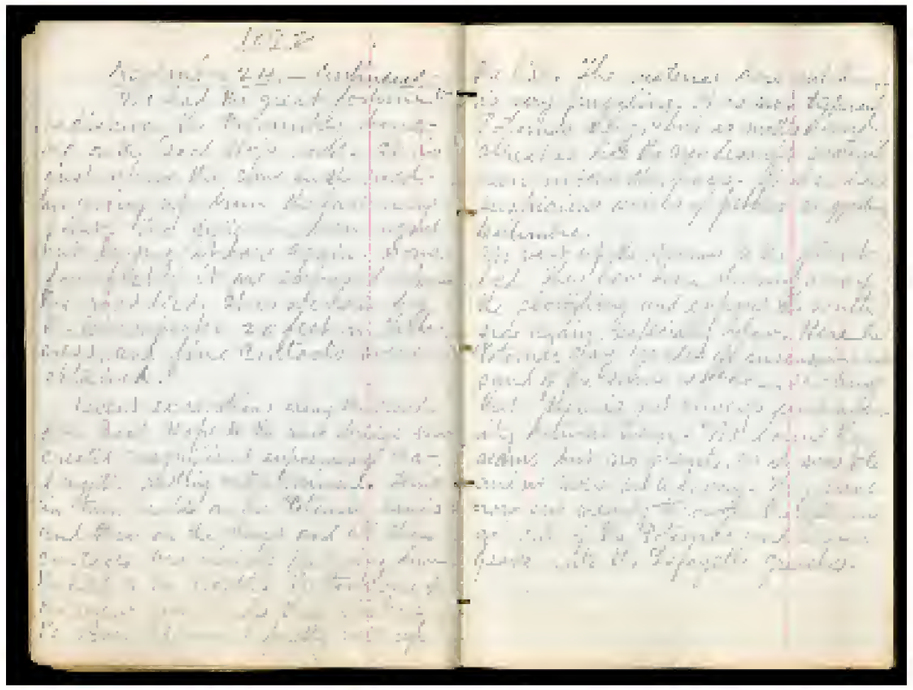
[[underlined]] 1892
November 24. - Continued. [[/underlined]]
We had the great fortune to rediscover the Pamunky bone-bed on the Good Hope road. It is just above the curve in the road in going up from the last named point. The gutter has been washed but laying it bare again. Some four feet of it are eclipsed below the road bed. It is overlain by the Chesapeake 20 feet in thickness, and fine contacts were obtained.
Recent excavations along the road from Good Hope to the new bridge have created magnificent exposures of LaFayette resting on the Miocene. This in turn rests on the Potomac sand and these on the clays and all these contacts are visible in going down the hill to the north. We took one of the new cut roads that strikes Pa. Ave. Extended pretty well up
[[end page]]
[[start page]]
the hill. The material here cut through is very puzzling. It is not typical Potomac clay, but is mottled and streaked like the nondescript material seen in some other places. It also has suspicious veins of pebbles suggesting Columbia.
We went up the Avenue to the plant bed. They have been clearing away the sloughing and exposed the south side again, especially below. Here the Potomac clay grades off insensibly with sand of the same red color, showing that there is not always unconformity between them. We found clay seams but no plants, as it was late and we were in a hurry. They have now cut nearly through the hill and got out of the Potomac and Chesapeake into the Lafayette gravels.



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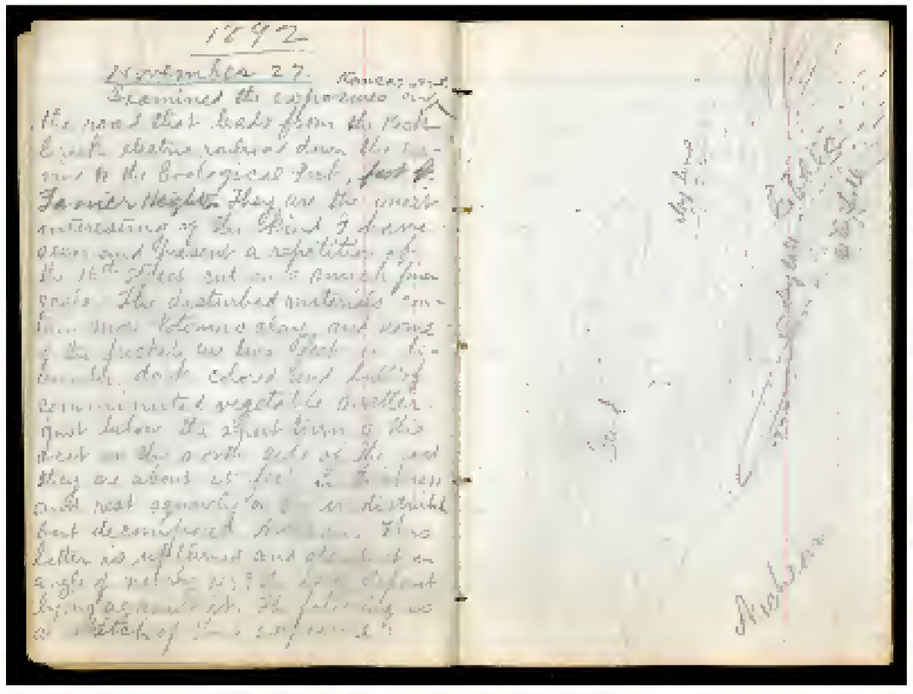
[[underlined]] 1892
November 27. [[/underlined]]
Examine the exposures on [[insertion]] ^ Kansas Ave [[/insertion]] the road that leads from the Rock Creek electric railroad down the ravine to the Zoological park, foot of Garnier Heights. They are the most interesting of the kind I have seen and present a repetition of the 16th street cut on a much finer scale. The disturbed materials contain more Potomac clay and some of the pockets are two feet in diameter, dark colored and full of comminuted vegetable matter.
Just below the short turn to the west on the north side of the road they are about 25 feet in thickness and rest squarely on the undisturbed but decomposed Archean. This latter is inclined and stands at an angle of nearly 45°, the later deposit lying against it. The following is a sketch of this exposure:
[[end page]]
[[start page]]
[[image: Pencil sketch showing the cross section of the location as described above.]]
[[image labels]]
Sand
Clay lens
Cobble
Clayball
Archean
[[/image labels]]

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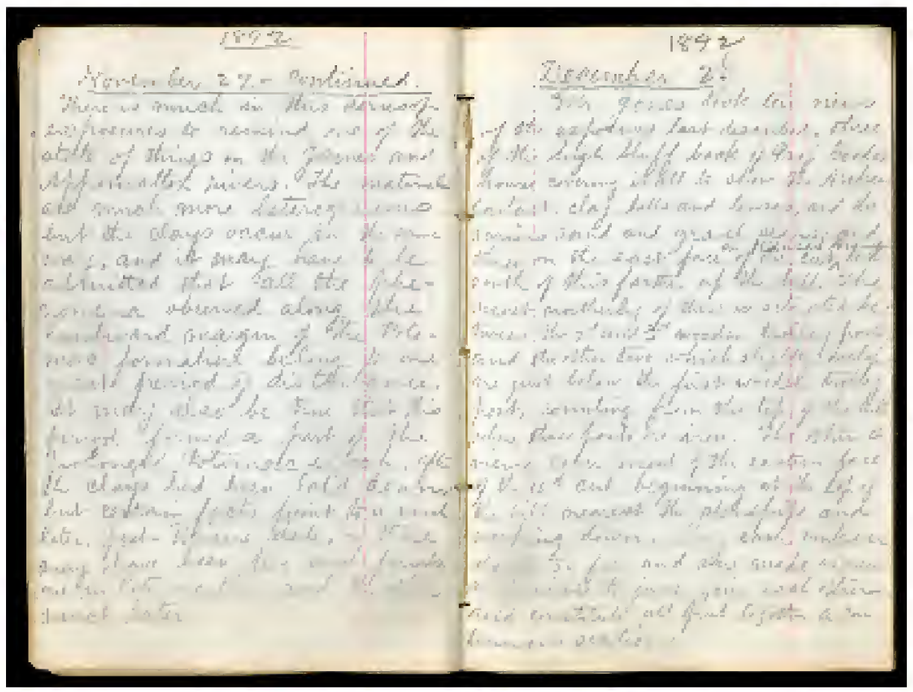
[[underline]] 1892 [[/underline]]
[[underline]] November 27- continued [[/underline]]
There is much in this series of exposures to remind one of the state of things on the James and Appomattox rivers. The material are much more heterogeneous but the clays occur in the same way, and it may have to be admitted that all the phenomena observed along the landward margin of the Potomac formation belong to one great period of disturbance. It may also be true that this period formed a part of the prolonged Potomac epoch, after the clays had been laid down but certain facts point to a much later, post-Miocene date, or there may have been true such periods are in Potomac time and the other much later.
[[end page]]
[[start page]]
1892
[[underline]] December 2d. [[/underline]]
Mr. Jones took ten views of the exposures last described, three of the high bluff back of Prof Goode's house covering it all to show the Archean contact, clay balls and lenses, and the various sand and gravel seams; and three on the east face of the cut [[insert]] ^ on Kansas Avenue [[/insert]] to the south of this farther up the hill. The most northerly of these is situated between the 2nd and 3rd wooden trolley posts, and the other two which slightly overlap are just below the first wooden trolley post, counting from the top of the hill where these posts are iron. The other 4 views cover most of the eastern face of the 16th cut beginning at the top of the hill nearest the plantlife and working down. They each embrace about 50 feet and were made as near as possible to just join each other and constitute all put together a continuous section.



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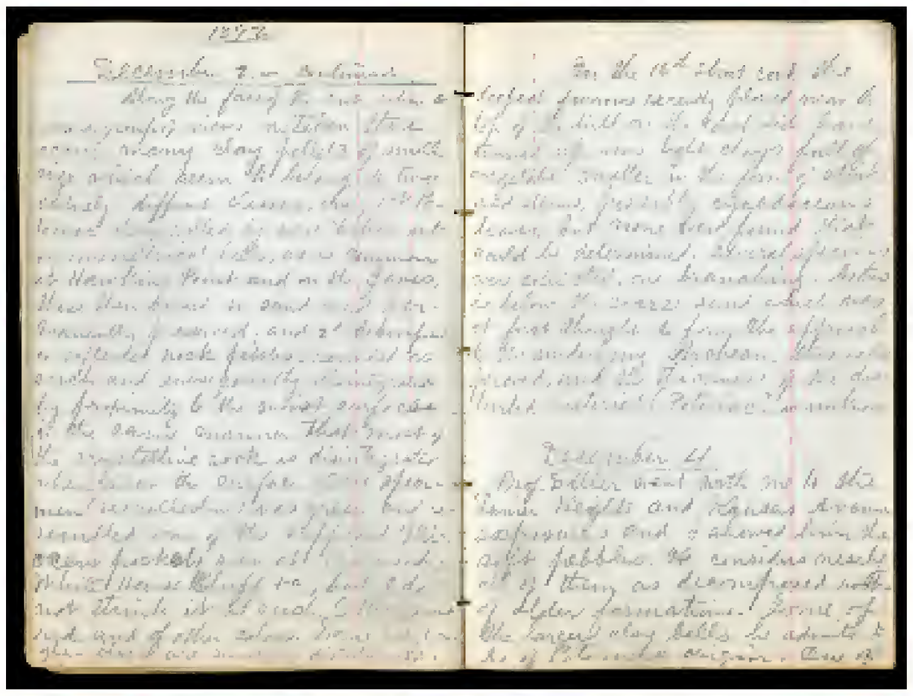
[[underlined]] 1892 [[/underlined]]
[[underlined]] December 2. - continued [[/underlined]]
Along the face of the cut where the second group of views was taken there occur many clay pellets of small size which seem to belong to two entirely different classes. viz. 1st Potomac clay rolled by wave action into symmetrical balls, as is common at Hawkins Point and on the James, these then buried in sand and permanently preserved, and 2d decomposed or softened rock pebbles, rounded as such and subsequently disintegrated by proximity to the moist surfaces in the same manner that most of the crystalline rock is disintegrated when near the surface. One specimen (see collection) was green and resembled some of the supposed Miocene pockets seen at Richmond, White House Bluff &c., but I do not think it is such. Others are red and of other colors. Some large angular block are similarly disintegrated.
[[end page]]
[[start page]]
In the 16th Street cut the deepest furrows recently plowed near the top of the hill on the east side have turned up some light clays full of vegetable matter in the form of sticks and stems, possibly cycadaceaus leaves, but none were found that could be determined. Several specimens were collected, one branching. As this is below the coarse sand which was at first thought to form the approach to the underlying Archean, this is disproved, and the thickness of the disturbed material (Potomac?) is unknown.

[[underlined]] December 4: [[/underlined]]
Prof. Diller went with me to the Lanier Heights and Kansas Avenue exposures and I showed him the soft pebbles. He considers nearly all of them as decomposed rocks of older formations. Some of the larger clay balls he admits to be of Potomac origin. One of



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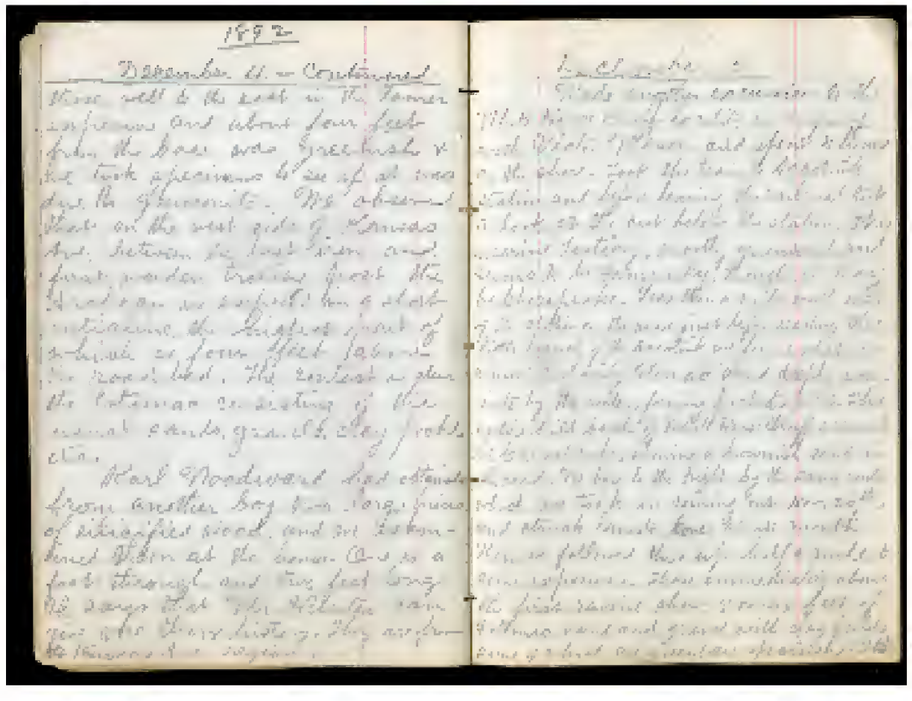
[[underlined]] 1892 [[/underlined]]
[[underlined]] December 4. - continued [[/underlined]]
those well to the east in the Lanier exposure and about four feet from the base was greenish & we took specimens to see if it was due to glauconite. We observed that on the west side of Kansas Ave., between the last iron and first wooden trolley post the Archaean is exposed in a short anticline the highest part of which is four feet above the road bed. The contact is clear the Potomac consisting of the usual sands, gravels, clay pockets etc.
Karl Woodward had obtained from another boy two large pieces of silicified wood, and we examined them at the house. One is a foot through and two feet long. He says that Mr. Hunter can give me their history. They are from the Kansas Ave. region.
[[end page]]
[[start page]]
[[underlined]] December 5 [[/underlined]]
Made another excursion to the White House Bluff locality in company with Victor Mason and spent 5 hours on the shore. Took the train to Accotink station and before leaving the railroad took a look at the cut below the station. Was Marine Tertiary, mostly greensand, and seems to be Pamunky, though it may be Chesapeake. Less than a mile south east of the station on the road just before reaching the little branch of the Accotink we found what is almost certainly Potomac sand deeply worn into by the water, forming pockets in it. The entire hill back of White House Bluff seems to be Chesapeake, showing a brownish sand in the road. We bore to the right by the same route which we took in coming out Nov. 20th, and struck Gunston Cove at its mouth. Then we followed this up half a mile to some exposures. Those immediately above the first ravine show 5 - or six feet of Potomac sand and gravel with clay pellets some of which are green (see specimens). The



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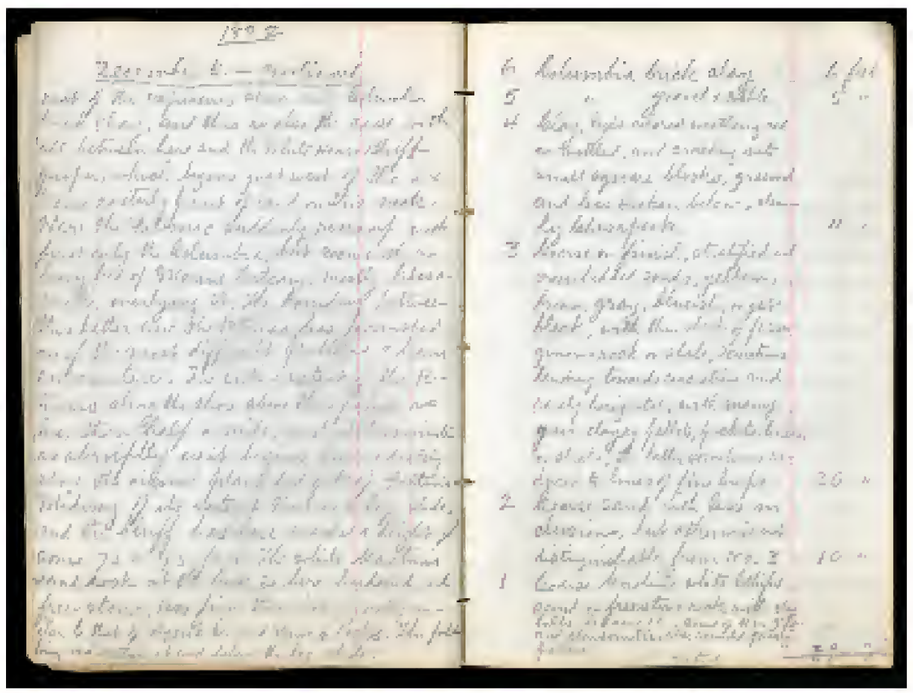
[[underline]] 1892 [[/underline]]
[[underline]] December 5. - Continued [[/underline]]
rest of the exposures show only Columbia brick clay, and this is also the case with all between here and the White House Bluff proper, which begins just west of the extreme easterly point of land on this neck.
Here the Potomac suddenly rises up with first only the Columbia, but soon with a heavy bed of Marine Tertiary, mostly Chesapeake overlying it. The boundary between this latter and the Potomac has furnished one of the most difficult problems I have encountered. The entire extent of the Potomac along the shore above this point is less than half a mile, and it terminates as abruptly as it begins immediately above the original plant bed of Prof. Fontaine Midway of its extent there is a log-slide, and the bluff has here reached a height of some 70 or 75 feet. The white kaolinic sand rock at the base is here hardened into free-stone, less firm than but generally similar to that of Aquia Cr. and Point of Rocks. The following is a section at and below the log-slide:
[[end page]]
[[start page]]
[[three columns, indicated in transcription by |]]
6 | Columbia brick clay | 6 feet
5 | " [[Ditto for: Columbia]] gravel and cobble | 5 " [[Ditto for: feet]]
4 | Clay, light colored weathering red or mottled, and cracking into small square blocks, greenish and less broken below, clearly Chesapeake | 4 " [[Ditto for: feet]]
3 | Coarse or firmish stratified and cross-bedded sands, yellow, brown, gray, blueish, or jet black, with thin sheets of ferruginous rock or shale, sometimes
tending towards concretions and rarely
horizontal, with many green clayey pellets, pockets, lenses, or strata, the
latter sometimes reduced to lines of fine lumps | 3 " [[Ditto for: feet]]
2 | Coarse sand with less inclusions, but otherwise not distinguishable from No. 3 | 10 " [[Ditto for: feet]]
1 | Coarse kaolinic white lithified sand or
freestone rock with clay balls, lenses
&c., some of them green and glauconitic, also rounded quartz pebbles | 20 " [[Ditto for: feet]]
[[line indicating addition]]
Total 75 " [[Ditto for: feet]]



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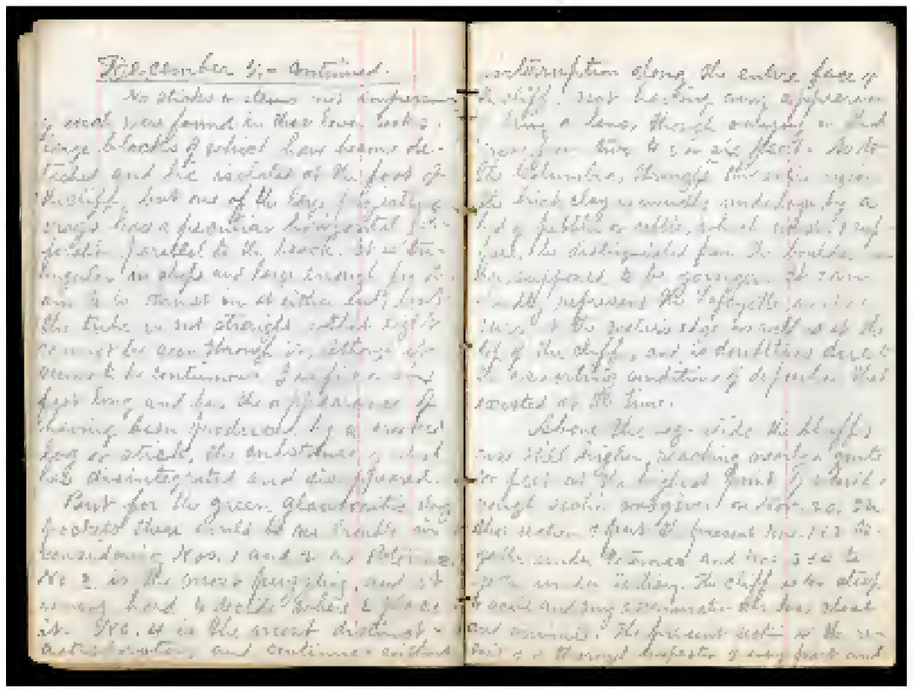
[[underline]] December 5. - continued. [[/underline]]
No sticks or stems nor impressions of such were found in these lower rocks, large blocks of which have become detached and lie isolated at the foot of the cliff, but one of the large projecting crags has a peculiar horizontal perforation parallel to the beach. It is triangular in shape and large enough for the arm to be thrust in at either end, but the tube is not straight so that light cannot be seen through it, although it seems to be continuous. It is five or six feet long and has the appearance of having been produced by a crooked log or stick, the substance of which has disintegrated and disappeared.
But for the green glauconitic clay pockets there would be no trouble in considering Nos. 1 and 2 as Potomac. No 3 is the most puzzling, and it is very hard to decide where to place it. No. 4 is the most distinct & satisfactory and continuous without
[[end page]]

[[start page]]
interruption along the entire face of the cliff, not having any appearance of being a lens, though varying in thickness from two to 5 or six feet. As to the Columbia, through [[insertion] ^ ou [[/insertion]] t this entire region the brick clay is usually underlain by a bed of pebbles or cobble, which must, I suppose, be distinguished from the boulder member, supposed to be younger. It can hardly represent the Lafayette, as it occurs at the water's edge as well as at the top of the cliff, and is doubtless due to the assorting conditions of deposition that existed at the time.
Above the log-slide the bluffs rise still higher, reaching nearly or quite 100 feet at the highest point of which a rough section was given on Nov. 20. In that section I put the present Nos. 1 & 2 together under Potomac and Nos. 3 & 4 together under Tertiary. The cliff is too steep to scale and my examination was less close and minute. The present section is the result of a thorough inspection of every part and



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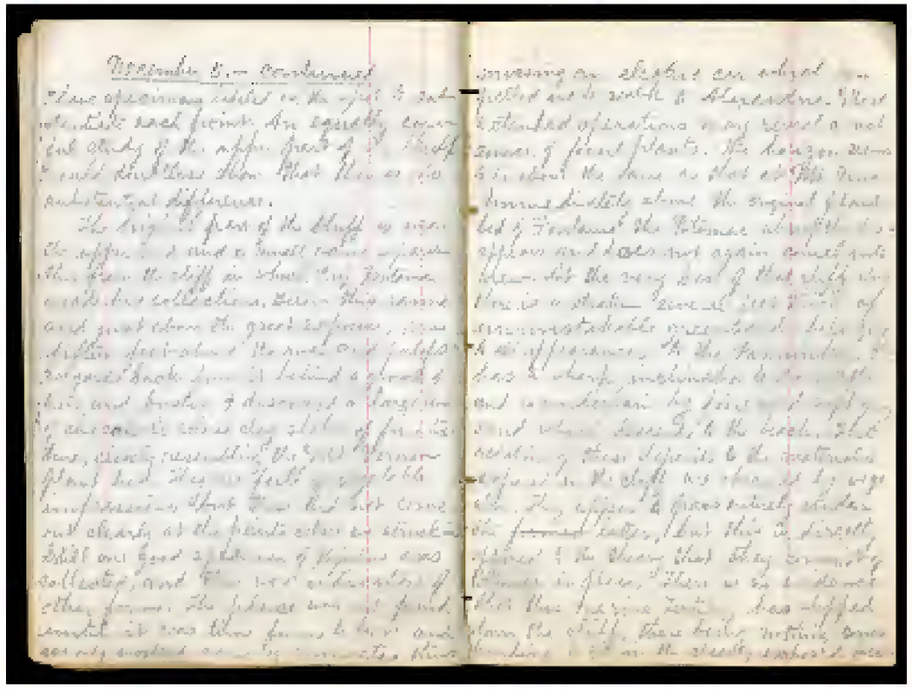
[[underline]] December 5. - Continued [[/underline]]
I have specimens labeled on the spot to substantiate each point. An equally careful study of the upper part of the bluff would doubtless show that there is no substantial difference.

The highest part of the bluff is near the upper end and a small ravine separates this from the cliff in which Prof. Fontaine made his collections. Below this ravine and just around the great exposure, some fifteen feet above the river and perhaps 30 yards back from it behind a growth of trees and bushes I discovered a large lens of chocolate colored clay shales of firm texture, closely resembling the Mt. Vernon plant bed. They are full of vegetable impressions, but these did not come out clearly at the points where we struck in. Still one good specimen of Populus was collected, and there were indications of other forms. The place was not found until it was time for us to leave and we only worked some 15 minutes, thus
[[end page]]

[[start page]]
missing our electric car which compelled us to walk to Alexandria. More extended operations may reveal a rich source of fossil plants. The horizon seems to be about the same as that at Mt Vernon. Immediately above the original plant bed of Fontaine the Potomac abruptly disappears and does not again come into view. At the very base of that cliff above there is a stratum several feet thick of unmistakable greensand belonging to all appearances to the Pamunkey. It has a sharp inclination to the north and is underlain by fine and soft grey sand which descends to the beach. The relations of these deposits to the materials exposed in the cliff are obscured by vegeation. They appear to pass entirely under the [[strikethrough]] former [[/strikethrough]] latter, but this is directly opposed to the theory that they consist of Potomac in place.
There is no evidence that this marine Tertiary has slipped down the cliff, there being nothing corresponding to it in the clearly exposed face.



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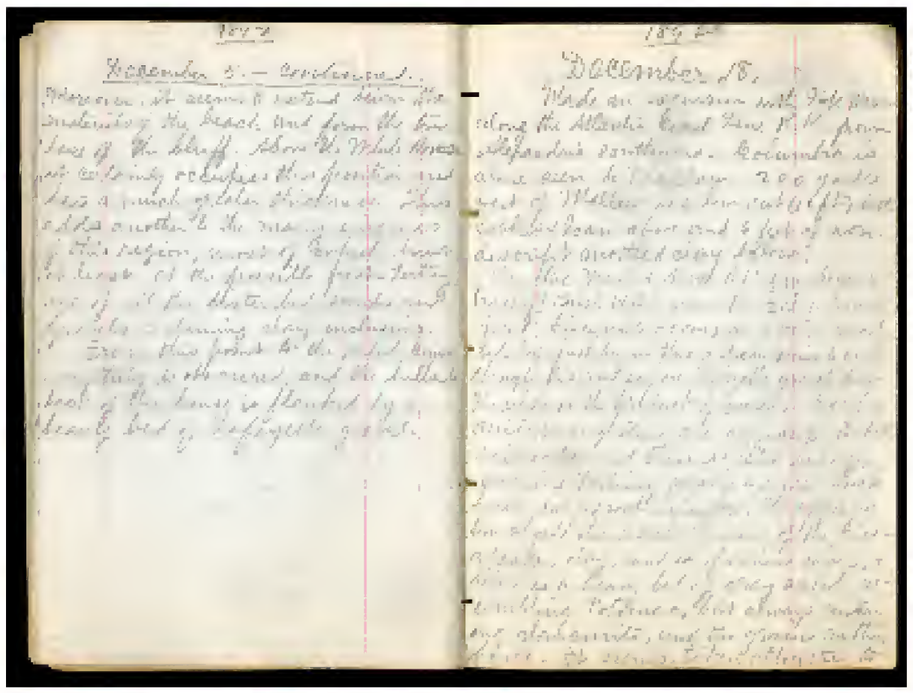
[[underline]] 1892
December 5. - continued. [[/underline]]
Moreover, it seems to extend below the materials of the beach and form the true base of the bluff. Above the White House it certainly occupies this position and has a much greater thickness. This adds another to the many enigmas of this region, most of which hint at least at the possible post-Tertiary age of all the disturbed sands and gravels containing clay inclusions.
From this point to the White House everything is obscured, and the hillside back of the house is flanked by a heavy bed of Lafayette gravel.
[[end page]]
[[start page]]
[[underline]] 1892 [[underline]]
December 18.
Made an excursion with Vick Mason along the Atlantic Coast Line R. R. from Alexandria southward. Columbia is alone seen to Mallow. 200 yards west of Mallow is a low cut (12 ft.) into cobbles & loam above and 6 feet of nondescript mottled clay below.
On the Wash. & Alex. R. R. 1/4 mi. beyond (crest of) Bush Hill near the 24 " [[Ditto for: mi.]] (11) mile post Chesapeake occurs at level of road bed. but just beyond this a stream seems to cut through this and expose Lafayette gravel below. The whole is the product of wash. Half a mile west of this are deep cuts in both railroads, and these exhibit beds of marine Tertiary nearly 40 feet thick barely capped with Lafayette. The upper portion shows the usual phases of the Chesapeake, clay, sand &c of various colors, & below is a heavy bed of gray sand resembling Potomac, but always containing glanconite, and the grains rather fine. It seems, taken altogether to



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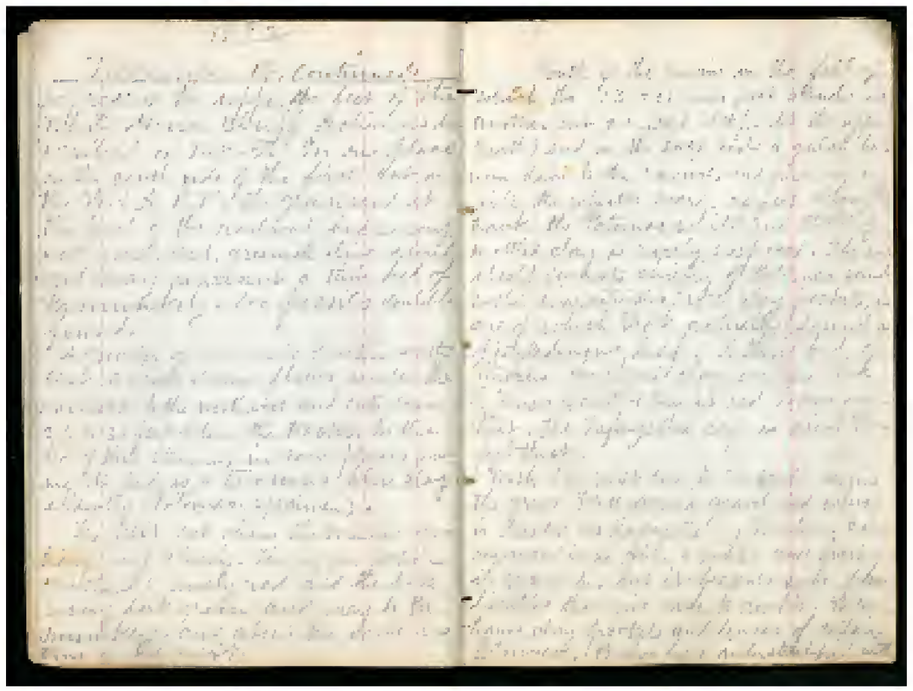

[[underline]] 1892 [[/underline]]
December 18, continued
[[line across page]]
represent the upper 40 feet of the White House Bluff section, as described on Dec. 5. In one place on the south side of the first cut on the W & A. R.R. the greensand at the level of the railroad bed is very well marked, greenish olive colored and may represent a thin bed of Pamunkey. No fossils could be found.
A quarter of a mile further south east a brisk stream flows under the railroad to the northwest and cuts down 25 or 30 feet below the tracks. In the bed of this stream, in some places forming its bed is a tenacious blue clay evidently Potomac (specimen).
The next cut shows the marine Tertiary very clearly. The upper portion weathers a lively red and the base is very dark green and may be Pamunkey, and about the same is true of the next.
[[end page]]
[[start page]]
South of the ravine in the fill of which the 13 (22) mile post stands is another cut 20 feet deep. At the upper (north) end on the east side a gulch has worn down to the ravine, and just opposite the whistle board, 20 feet below the track the Potomac white and slightly mottled clay is nicely exposed. The cut itself consists chiefly of Potomac sand rather characteristic with clay pockets in one of which Vick actually found a dicotyledonous leaf. A thin bed of Miocene checkered clay overlies the Potomac sand & there is red loam over that. The Lafayette cap is about three feet thick.
With the next cut to the south begins the great Franconia gravel bed which is treated as Lafayette by Darton. I also regarded it so when I visited and part of it must be, but it presents some peculiarities that give rise to doubts. It contains clay pockets and lenses of certain Potomac. It also has interstratified with

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[[underline]] 1892 [[/underline]]
December 18, continued
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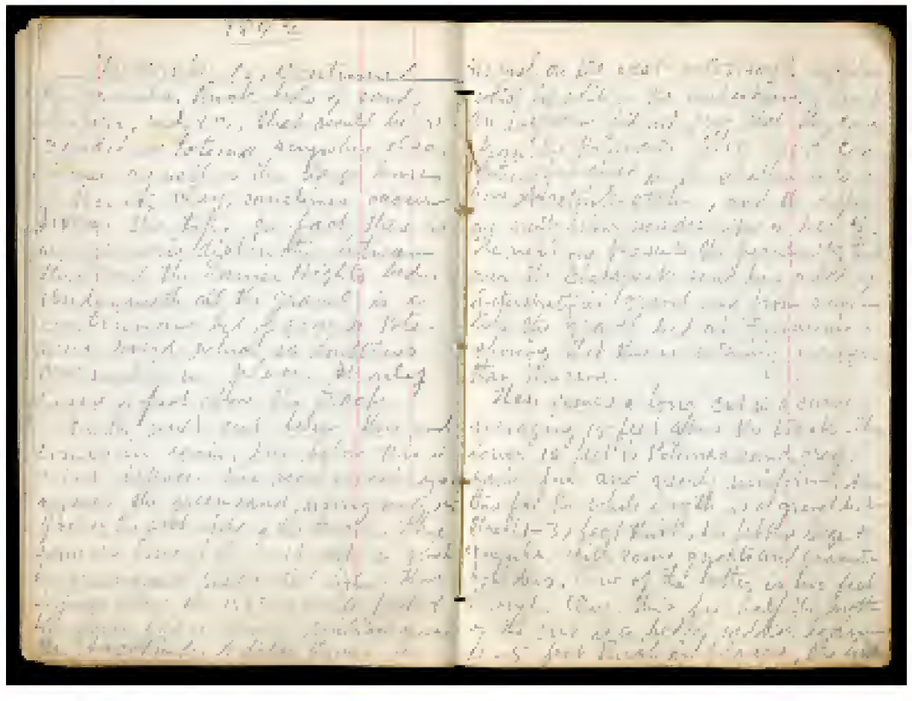
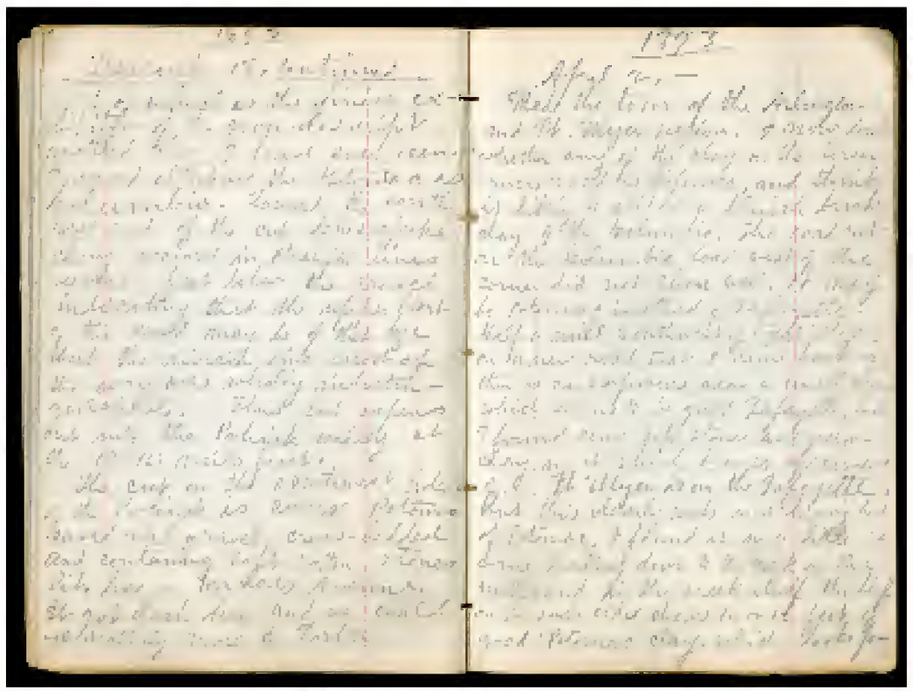
the gravels, thick beds of sand, brown, red, &c. that would be regarded as Potomac anywhere else. These as well as the large lenses of pink clay, sometimes occur near the top. In fact there is no generic distinction between this and the Lanier Hights bed. Underneath all the gravel is a continuous bed of coarse Potomac sand which is doubtless normally in place. It only rises a foot above the track.
In the next cut below this sand comes in again, but below this in a cut between two road crossings appears the greensand, rising nearly 15 feet on the west side of the track. The same is true of the next cut in which the greensand rises still higher. This is just above the 15 (20) mile post & the first place where the railroad crosses the Accotink. A ditch through a
[[end page]]
[[start page]]
marsh on the west cuts through pebbles which lie white on the embankment, but an inspection did not prove that they come from the Potomac. The same conditions prevailed in the shallow cuts above Accotink station, and the deeper one next below was described on Dec. 5. The next one presents the peculiarity that over the Chesapeake sand lies a bed of interstratified gravel and brown sand like the gravel bed at Franconia, showing that this is certainly younger than Miocene.
Then comes a long cut in a curve averaging 15 feet above the tracks. The lower 10 feet is Potomac sand, gray, rather fine and nearly uniform. Above this for the whole length is a gravel bed three (1-3) feet thick, the pebbles large & angular, with some quarts and granite boulders. One of the latter is two feet through. Over this for half the length of the cut is a bed of reddish loam 4-5 feet thick in places. The lower



[[underline]] 1892 [[/underline]]
December 18, continued
[[line across page]]
part of which is the finest exhibition of the non-descript mottled clay I have ever seen. I regard all above the Potomac as Columbia. Toward the south west end of the cut Chesapeake Clay occurred in stratified lines several feet below the gravel indicating that the upper part of the sand may be of that age but the division line most of the way was wholly indistinguishable. This cut oapens out into the Pohick valley at the 19 (16) mile post.
Its cut on the southwest side of the Pohick is coarse Potomac sand and gravel cross-bedded and containing soft rotten stones like here on Kansas Avenue. It got dark her and we could see nothing more to Lorton.
[[end page]]
[[start page]]
[[underline]] 1893 [[/underline]]
April 2,-
Made the tour of the Arlington and Ft. Myer region. I now doubt whether any of the clay on the lower (river) road is Potomac, and think it likely to all be a bluish brick clay of the Columbia. The road cut on the Columbia Road west of the corner did not show well. It may be Potomac instead of Lafayette. Half a mile southwest of Fort Myer on a new road that I came back on then is an exposure near a small stream which seems to be good Lafayette but I found some soft stones and green clay in it which brought specimens of .. Ft Myer is on the Lafayette , but this clearly rests on a heavy bed of Potomac. I found it in a little ravine leading down to the creek on the north and in the creek itself the bluff on the south side shows 10 or 12 feet of good Potomac clay which looks fa-



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1893
April 2, continued
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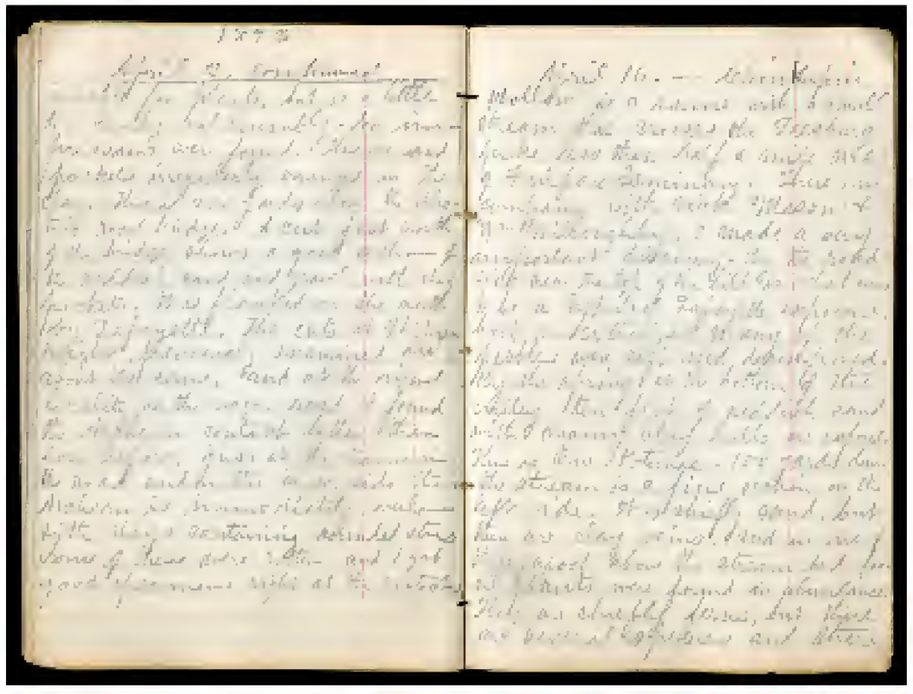
varable for plants, but is a little too sandy and crumbly. No impressions were found. There are sand pockets irregularly arranged in the clay. This is 200 yards above Electric road bridge. A cut just north of the bridge shows a good section of the reddish sand and gravel with clay pockets. It is flanked on the north by Lafayette. The cuts at Ft. Myer Heights, previously examined, are about the same and at the original locality on the wagon road I found the Archeon contact better than ever before. Just at the turn in the road and on the n.w. side the Archeon is immediately overlain with clays containing rounded stones Some of these were rotten and I got good specimens right at the contact
[[end page]]
[[start page]]
April 16 - Chinkapin Hollow is a ravine with a small stream that crosses the Leesburg pike less than half a mile n.e. of Fairfax Seminary. There, in comparing with Vick Mason & Wm Willoughby, I made a very important discovery. By the roadside near the top of the hill is what seems to be a typical Lafayette exposure, but nevertheless many of the pebbles were soft and decomposed. By the spring at the bottom of the valley ten feet of reddish sand with many clay balls are exposed. This is true Potomac. 100 yards down the stream is a fine section on the left side. It is chiefly sand, but there are clay veins, and in one of these a foot above the stream bed fossil plants were fund in abundance. They are chiefly ferns, but there are several species and there



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[[underline]] 1893 [[/underline]]
April 16. - continued
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are also conifers, cycads or Nageiopsis and a few dicotyledons. Quite a large collection was made here. Further down the banks are much higher (20 feet) consisting chiefly of sand beautifully cross bedded or with pockets, lenses and various irregularities, and of different colors. Pretty high up in the largest exposure is a thin vein of fine buff or pinkish clay containing abundant remains of a Sequoia and many male aments, also seeds and other parts. Here also I found a shell.
Near Convalescent Camp on the road to Arlington just this side (north) of the little swamp where Henshaw and I botanized, is a sand pit showing 10 feet of light colored Kaolinic sand The whole is Potomac.

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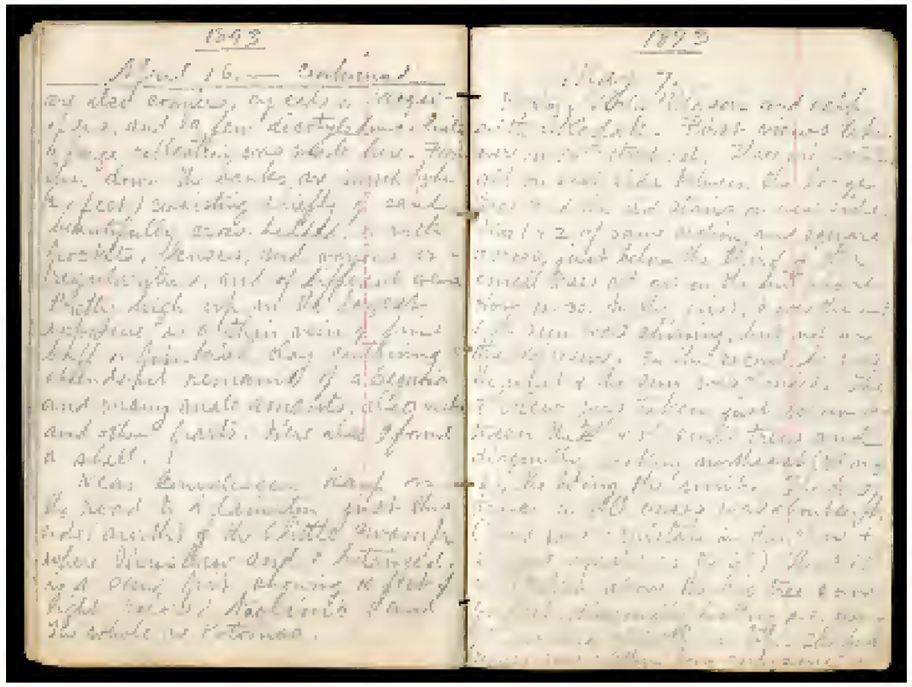
[[underlined]] 1893 [[/underlined]]
May 7.
Party. Victor Mason and self, with Kodak. First views taken were on 16th street ext. Three views taken all on east side between the large tree and the old stairs on west side. Nos. 1 & 2 of same section and square across, just below the third of the small trees set out on the hill above. Hour 10-30. In the first, I was in the unit & the sun was shining, but not on the exposure. In the second he was the unit & the sun was clouded. The 3d view was taken just below between the [[strikethrough]] 3 [[/strikethrough]] 4th & 5th small trees and diagonally looking northeast (30° n of e), he being the unit. The distance in all cases was about 40 ft. (There was a mistake in this 3d one & it was repeated as the 6th) The 4th & 5th were taken above the big tree some 60 feet, diagonally looking s.e. showing Columbia gravel on top. The fair (No. 4) was rather long exposure,



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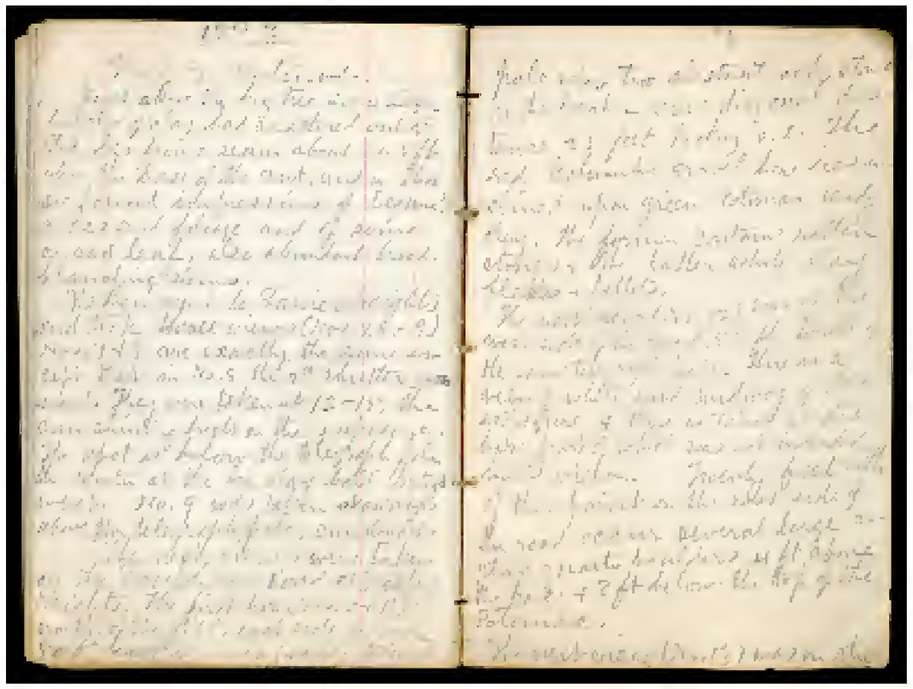

[[underline]] 1893 [[/underline]]
May 7 continued.
Just above the big tree some large blocks of clay had weathered out of the his froma seam about 6 or 8 ft above the base of the cut, and in those we found impressions of Sequoia? coves and foliage and of some cycad leaf, alos abundant broad branching stems.
We then went to Lanier Heights and took three views (Nos. 7,8, +9) Nos. 7 + 8 are exactly the same except that in No. 8 the 2d shutter was used. They were taken at 12-15, the sun shining bright on the exposure. The spot is below the telegraph pole the center at the big clay ball farthest west. No. 9 was taken at an angle above the telegraph pole, sun clouded.
The next views were taken on the Loughboro Road at Wesley Heights. The first two (Nos. 10 & 11) north of the field, east side of road 50 ft. east of most easterly telegraph

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pole, where two chestnut oaks stand on the bank _ view diagonal, distance 25 feet, looking s.e. The red Columbia gravel here lies inclined upon green Potomac sandy clay. The former contains rotten stones & the latter white clay flakes & pellets.

The next view (No. 12) was of the west side of the road, 50 ft. south of the same telegraph pole. There is a vein of white sand midway of the exposure & there is talus at the base, part of which was not included in the view. Twenty feet south of this point on the east side of the road occur several large anglar quartz boulders 4 ft above the base & 8 ft below the top of the Potomac.

The next view (No. 13) was on the

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[[underlined]] 1893
May 7. - continued. [[/underlined]]

east side with the most southerly telegraph pole as its southern end, diagonal looking s.e. Here there is no Columbian cap and the Potomac is well stratified in very irregular but little broken lines. One of the higher strata is ferringuous shale. Others are pink & white. Quartz pebbles are scattered through, and mica flakes glisten throughout as in the Archaean.

No. 14 is e. side of road in cut s. of fill (Rock Haven), near n. end. Exposure shows pink gravel with clay & sand vein nicely stratified gravel below.

No. 15. w. side, 50 ft south of last. Gravel below, running

[[end page]]
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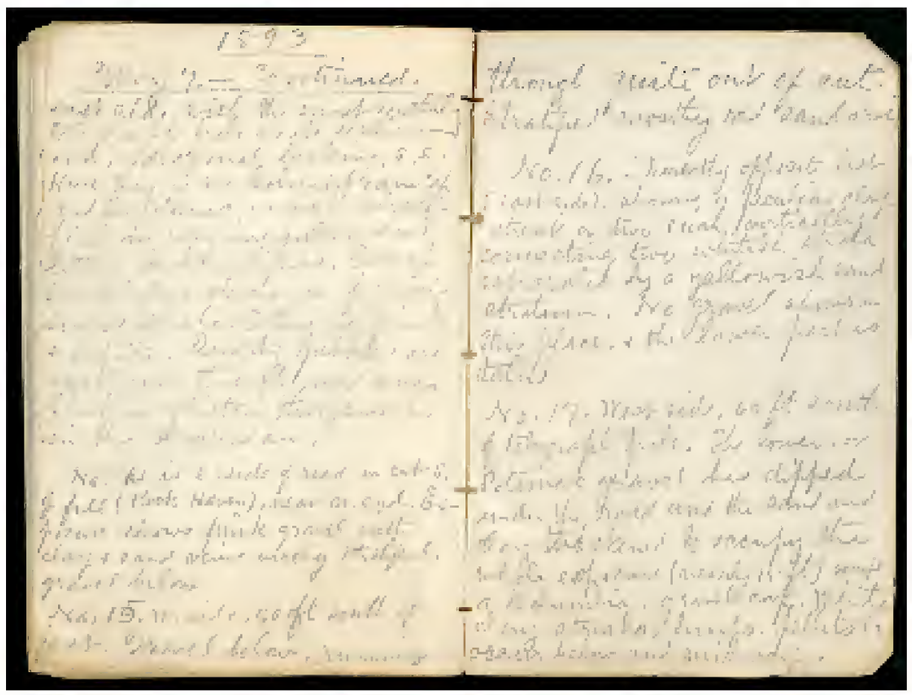
through quite out of cut. Stratified mostly red sand above.

No. 16. - Directly opposite last (east side), showing a peculiar clay streak or two such vertically connecting two whitish strata separated by a yellowish sand stratum. No gravel shows in this place, & the lower part is talus.

No. 17. West side, 60 ft south of telegraph pole. The lower, or Potomac gravel has dipped under the road and the sand and clay thickened to occupy the whole exposure (nearly 15 ft) except a Columbia? gravel cap. White clay streaks, lumps, pellets &c occur below and midway.



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[[underline]] 1893
May 7. - continued. [/underline]

No. 18.- Exactly opposite last (east side). Conditions nearly the same but cut lower & talus below.

At the north end of this cut on the east side of the road, the Archean rises 8 feet above the road bed and ends abruptly very soon, the exact form being obscured by recent debris.
It appears to dip rapidly to the south and pass below the Potomac, which occupies all the rest of the cut. The conclusion is that it forms an anticline & that there was a valley to the south of this point which was filled up in Potomac time.
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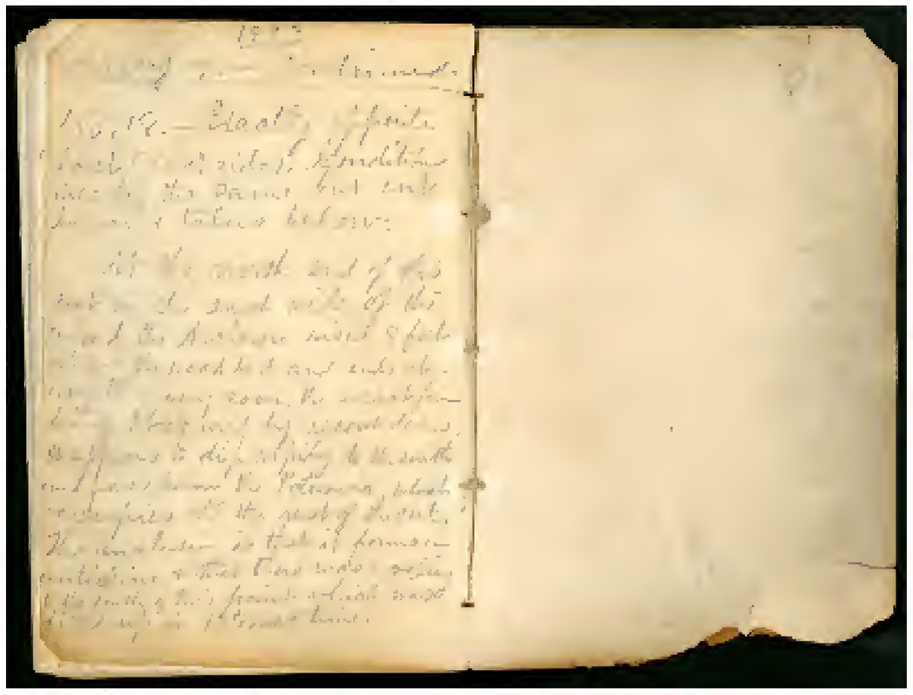

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